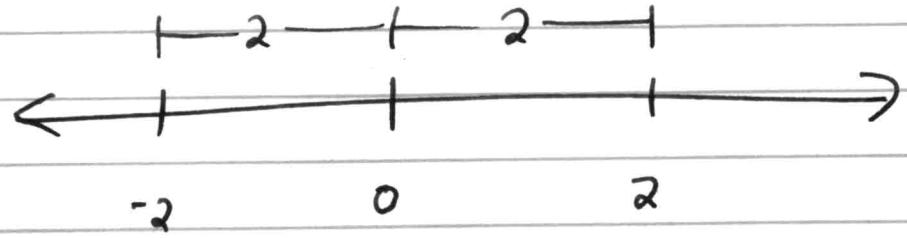
1060, Fa13
Day 3

Really start precalc next week,
Before we [redacted] we need one more defn & set of techniques

$$|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

graphical meaning: distance from 0



5-10

2 and -2 are the same distance from 0

solving equalities with $|x|$ is easy

$$|-2x+2| = 6$$

means

$-2x+2 = 6$ OR $-(2x+2) = 6$

$-2x = 4$ OR $-2x+2 = -6$

$-2x = -8$

So either $x = -2$ OR $x = 4$

[redacted]

We Can Solve inequalities
with absolute values

THE SAME WAY
as other inequalities

Step 1: find x where its $=$ [redacted]
plot as $\circ$ or $\bullet$

Step 2: find x where its undefined
plot as $\circ$

Step 3: fill in intervals

Eg: find x where

$$|-2x+2| > 6$$

Step 1: $|-2x+2| = 6$

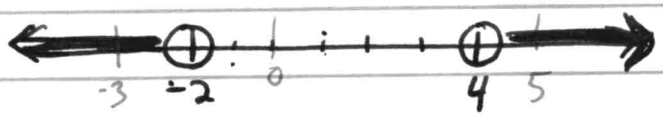
$\Leftrightarrow$

$-2x+2 = 6$ OR $-2x+2 = -6$

$-2x = 4$ $\quad$ $-2x = -8$

$x = -2$ OR $x = 4$

Step 2



true for x in $(-\infty, -2) \cup (4, \infty)$

Step 2: always defined

Step 3: check intervals

$x = 0 \Rightarrow |-2 \cdot 0 + 2| = |2| = 2$ ✗

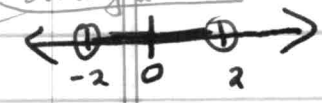
$x = -3 \Rightarrow |-2(-3) + 2| = |8| = 8$ ✓

$x = 5 \Rightarrow |-2 \cdot 5 + 2| = |-8| = 8$ ✓

we can also solve INEQUALITIES with $|x|$ using thought.

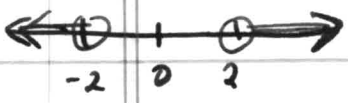
use sketch to keep these straight

$|x| < 2$ means "x is at most 2 (distance) from 0"



and so means $-2 < x < 2$

$|x| > 2$ means "x is at least distance 2 from 0"



and so means $x < -2$ OR $x > 2$

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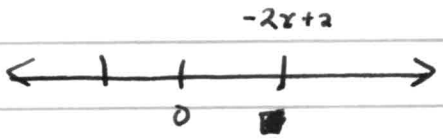
eg: $|-2x+2| > 6$



means

either $(-2x+2) < -6$ OR $(-2x+2) > 6$

so either $-2x < -8$ OR $-2x > 4$

$x > 4$ OR $x < -2$

the solution is $(-\infty, -2) \cup (4, \infty)$